

CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

1-3. (Cancelled)

4. (Currently Amended) An electron-excited nano-crystal phosphor ~~as defined in claim 29 made up of at least three parts of nano-sized composite nano-particles comprising:~~

~~a core part of nano-crystal phosphor particle doped with an activator, the phosphor particle being selected from the group consisting of ZnS:Mn, ZnS:Cl, ZnS:Cu, Al, CaS:Eu, CaS:Ce, CaS:Mn, CaS:Cu, CaS:Sb, CaS:Eu, Ce, CaS:Sm, CaS:Pb, CaS:Gd, CaS:Tb, CaS:Dy, CaS:Ho, CaS:Er, CaS:Tm, CaS:Yb, MgS:Eu, MgS:Ce, MgS:Mn, SrS:Eu, SrS:Ce, SrS:Mn, BaS:Eu, BaS:Ce and BaS:Mn;~~

~~a surface-modifying part coating the surface of the core part and having a bonding part for bonding the periphery of the core part to a bond defect of the nano-crystal phosphor particle; and~~

~~an insulating shell part coating the surface of the surface-modifying part, the insulating shell part being formed of, as a substrate, a surface-modifying agent forming a glass state on the surface of the surface-modifying part,~~

wherein the surface-modifying agent ~~having on~~ the surface-modifying part having ~~a~~ the covalent bond part forming ~~a~~ the covalent bond with the bond defect of ~~said the~~ composite nano-particles is an organometallic compound having SH group, -NH₃ group at its terminal and

the insulating shell part comprises a transparent material.

5. (Previously Presented) An electron-excited nano-crystal phosphor as defined in claim 4, wherein the transparent material comprises as a main component a compound selected from the group consisting of SiO, SiO₂, SiN, SiON, Si₃N₄, Al₂O₃, and TiO₂.

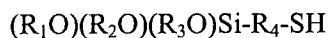
6. (Currently Amended) An electron-excited nano-crystal phosphor as defined in claim 29 made up of at least three parts of nano-sized composite nano-particles comprising:

a core part of nano-crystal phosphor particle doped with an activator, the phosphor particle being selected from the group consisting of ZnS:Mn, ZnS:Cl, ZnS:Cu, Al, CaS:Eu, CaS:Ce, CaS:Mn, CaS:Cu, CaS:Sb, CaS:Eu, Ce, CaS:Sm, CaS:Pb, CaS:Gd, CaS:Tb, CaS:Dy, CaS:Ho, CaS:Er, CaS:Tm, CaS:Yb, MgS:Eu, MgS:Ce, MgS:Mn, SrS:Eu, SrS:Ce, SrS:Mn, BaS:Eu, BaS:Ce and BaS:Mn;

a surface-modifying part coating the surface of the core part and having a bonding part for bonding the periphery of the core part to a bond defect of the nano-crystal phosphor particle; and

an insulating shell part coating the surface of the surface-modifying part, the insulating shell part being formed of, as a substrate, a surface-modifying agent forming a glass state on the surface of the surface-modifying part,

wherein said surface-modifying agent is illustrated by the general formula;



wherein each of R₁, R₂, R₃ and R₄ is an alkyl group.

7. (Cancelled)

8. (Currently Amended) An electron-excited nano-crystal phosphor as defined in claim 29 made up of at least three parts of nano-sized composite nano-particles comprising:

a core part of nano-crystal phosphor particle doped with an activator, the phosphor particle being selected from the group consisting of ZnS:Mn, ZnS:Cl, ZnS:Cu, Al, CaS:Eu, CaS:Ce, CaS:Mn, CaS:Cu, CaS:Sb, CaS:Eu, Ce, CaS:Sm, CaS:Pb, CaS:Gd, CaS:Tb, CaS:Dy, CaS:Ho, CaS:Er, CaS:Tm, CaS:Yb, MgS:Eu, MgS:Ce, MgS:Mn, SrS:Eu, SrS:Ce, SrS:Mn, BaS:Eu, BaS:Ce and BaS:Mn;

a surface-modifying part coating the surface of the core part and having a bonding part for bonding the periphery of the core part to a bond defect of the nano-crystal phosphor particle; and

an insulating shell part coating the surface of the surface-modifying part, the insulating shell part being formed of, as a substrate, a surface-modifying agent forming a glass state on the surface of the surface-modifying part,

wherein the surface-modifying part of the composite nano-particles is carbonized.

9. - 11. (Cancelled)

12. (Currently Amended) A method of preparing an electron-excited nano-crystal phosphor as defined in claim 30 comprising the steps of:

forming a core part of an electron-excited composite nano-crystal phosphor and a surface-modifying part for coating the surface of said core part concurrently by a coprecipitation method in the presence of both a dispersion-stabilizing agent and a surface-modifying agent; and

forming a nano-sized insulating part on the surface of said surface-modifying part;

wherein said nano-crystal phosphor is selected from the group consisting of ZnS:Mn, ZnS:Cl, ZnS:Cu, Al, CaS:Eu, CaS:Ce, CaS:Mn, CaS:Cu, CaS:Sb, CaS:Eu, Ce, CaS:Sm, CaS:Pb, CaS:Gd, CaS:Tb, CaS:Dy, CaS:Ho, CaS:Er, CaS:Tm, CaS:Yb, MgS:Eu, MgS:Ce, MgS:Mn, SrS:Eu, SrS:Ce, SrS:Mn, BaS:Eu, BaS:Ce and BaS:Mn, and is prepared by a sequential step of adding the sulfide phosphor matrix as an anion material and Group II metal as a cation material so as to coprecipitate the anion material and the cation material of the phosphor in that order,

wherein said dispersion-stabilizing agent is a metallic salt having at least two carboxyl groups.

13. (Currently Amended) A method of preparing an electron-excited nano-crystal phosphor as defined in claim 30 comprising the steps of:

forming a core part of an electron-excited composite nano-crystal phosphor and a surface-modifying part for coating the surface of said core part concurrently by a coprecipitation method in the presence of both a dispersion-stabilizing agent and a surface-modifying agent; and

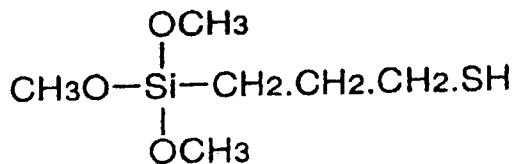
forming a nano-sized insulating part on the surface of said surface-modifying part;

wherein said nano-crystal phosphor is selected from the group consisting of ZnS:Mn, ZnS:Cl, ZnS:Cu, Al, CaS:Eu, CaS:Ce, CaS:Mn, CaS:Cu, CaS:Sb, CaS:Eu, Ce, CaS:Sm, CaS:Pb, CaS:Gd, CaS:Tb, CaS:Dy, CaS:Ho, CaS:Er, CaS:Tm, CaS:Yb, MgS:Eu, MgS:Ce, MgS:Mn, SrS:Eu, SrS:Ce, SrS:Mn, BaS:Eu, BaS:Ce and BaS:Mn, and is prepared by a sequential step of adding the sulfide phosphor matrix as an anion material and Group II metal as a cation material so as to coprecipitate the anion material and the cation material of the phosphor in that order,

wherein said surface-modifying agent is an organometallic compound having -SH group, -NH₃ group at its terminal.

14. (Previously Presented) A method of preparing an electron-excited nano-crystal phosphor as defined in claim 13, wherein said organometallic compound is 3-mercaptopropyl trimethoxysilane (MPS) illustrated by the chemical formula 1.

(chemical formula 1)



15. (Currently Amended) A method of preparing an electron-excited nano-crystal phosphor as defined in claim 30. A method of preparing an electron-excited nano-crystal phosphor as defined in claim 30 comprising the steps of:

forming a core part of an electron-excited composite nano-crystal phosphor and a surface-modifying part for coating the surface of said core part concurrently by a coprecipitation method in the presence of both a dispersion-stabilizing agent and a surface-modifying agent; and

forming a nano-sized insulating part on the surface of said surface-modifying part;

wherein said nano-crystal phosphor is selected from the group consisting of ZnS:Mn, ZnS:Cl, ZnS:Cu, Al, CaS:Eu, CaS:Ce, CaS:Mn, CaS:Cu, CaS:Sb, CaS:Eu, Ce, CaS:Sm, CaS:Pb, CaS:Gd, CaS:Tb, CaS:Dy, CaS:Ho, CaS:Er, CaS:Tm, CaS:Yb, MgS:Eu, MgS:Ce, MgS:Mn, SrS:Eu, SrS:Ce, SrS:Mn, BaS:Eu, BaS:Ce and BaS:Mn, and is prepared by a sequential step of adding the sulfide phosphor matrix as an anion material and Group II metal as a cation material so as to coprecipitate the anion material and the cation material of the phosphor in that order,

wherein in the step of forming the nano-sized insulating shell layer on the surface of the core layer of the composite nano-particle, said insulating shell layer is formed of sodium silicate.

16 – 30. (Cancelled)

31. (Currently Amended) A method of preparing an electron-excited nano-crystal phosphor as defined in claim 30 comprising the steps of:

forming a core part of an electron-excited composite nano-crystal phosphor and a surface-modifying part for coating the surface of said core part concurrently by a coprecipitation method in the presence of both a dispersion-stabilizing agent and a surface-modifying agent; and

forming a nano-sized insulating part on the surface of said surface-modifying part;

wherein said nano-crystal phosphor is selected from the group consisting of ZnS:Mn, ZnS:Cl, ZnS:Cu, Al, CaS:Eu, CaS:Ce, CaS:Mn, CaS:Cu, CaS:Sb, CaS:Eu, Ce, CaS:Sm, CaS:Pb, CaS:Gd, CaS:Tb, CaS:Dy, CaS:Ho, CaS:Er, CaS:Tm, CaS:Yb, MgS:Eu, MgS:Ce, MgS:Mn, SrS:Eu, SrS:Ce, SrS:Mn, BaS:Eu, BaS:Ce and BaS:Mn, and is prepared by a sequential step of adding the sulfide phosphor matrix as an anion material and Group II metal as a cation material so as to coprecipitate the anion material and the cation material of the phosphor in that order,

wherein said dispersion-stabilizing agent is sodium citrate.